

# Exhibit

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**Supplemental Expert Report  
of  
James T. Wells, PhD, PG**

*L. Everett & Associates, LLC*

In the matter of:

**McClurg, et al.**

v.

**Mallinckrodt, Inc., et al.**

**August 1, 2019**

# **Supplemental Expert Report of James T. Wells, PhD, PG**

*L. Everett & Associates, LLC.*

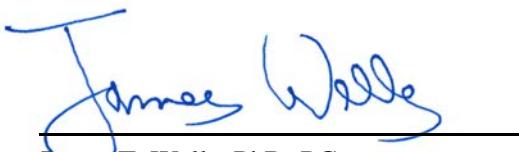
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I declare under penalty of perjury that the following is true and correct, to the best of my information and belief. Executed on August 1, 2019 at Santa Barbara, California.

A handwritten signature in blue ink, appearing to read "James T. Wells". It is written in a cursive style with a long horizontal stroke on the left and a more vertical, stylized "James" and "Wells" on the right.

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James T. Wells, PhD, PG  
L. Everett & Associates, LLC

## **Section 1. Introduction and Methodology**

I have been retained by Humphrey, Farrington & McClain on behalf of certain plaintiffs in this case to provide scientific input and expert opinions concerning the nature and extent of contamination on and around the St. Louis Airport Storage Site (SLAPS), the Hazelwood Interim Storage Site (HISS; also known as the Latty Avenue Site) and properties in the vicinity of these sites, including Coldwater Creek: all in Missouri. I have also been asked to evaluate the fate and transport mechanisms that led contamination to spread into the vicinity areas. I submitted an expert report in this matter on March 31, 2019. The March 31<sup>st</sup> report related to certain information requirements specified in Case Management Order No. 14 for Future Consolidated Cases Filed Against Cotter Corporation (NSL) and/or Mallinckrodt LLC, dated October 15, 2018. In my March 31<sup>st</sup> report, I reserved the right to submit supplemental opinions, which I am doing at this time.

In this report, I have provided my supplemental opinions and the bases for these opinions. In arriving at the opinions expressed in this report, I have relied upon my education and more than 25 years of experience in environmental science, hydrogeology and mechanisms of contaminant migration, including the groundwater, surface water and wind-borne transport which are key areas of impact in this case. I have also relied upon my review of the types of data and documents commonly relied upon by experts in the field. The documents relied upon include those cited in this Report and were reviewed by myself or other staff at L. Everett & Associates, under my direction. I have reviewed thousands of pages of documents made available by the US Army Corps of Engineers (USACE), Atomic Energy Commission (AEC), Nuclear Regulatory Commission (NRC), the potentially responsible parties and their consultants, as well as law firms involved in in this case. Further, I have relied upon reference texts commonly accepted and held reliable by experts in the fields of environmental science, hydrogeology and contaminant fate and transport, as well as generally accepted principles in those fields. I have considered multiple lines of evidence in my approach as is accepted environmental practice and have also considered alternative theories and explanations in arriving at these conclusions. The documents and data considered in preparation of this report are cited in the text and referenced in footnotes. The opinions described in this report are made to a reasonable degree of scientific certainty and were arrived at using the same methodology I employ in non-litigation projects.

I have 25 years of professional experience as an environmental geologist. I more fully described my relevant qualifications and experience in my March 31<sup>st</sup> report. For reviewing data and preparing this report, L. Everett & Associates invoices my time at the rate of \$275/hr. My hourly rate for deposition and trial testimony is \$500/hr. A complete copy of my resume is provided as Appendix A of my March 31<sup>st</sup>, 2019 report. I have given expert testimony within the last four years, in deposition or trial, as set forth in my resume.

### **Summary of Opinions**

This is a case about releases of radiological compounds and metals from the St. Louis Airport Storage Site (SLAPS), the Hazelwood Interim Storage Site (also known as “HISS” or the Latty Avenue Site) and haul roads to and from these properties. Over the years, radiological and metal constituents have migrated from these sites by a variety of transport pathways, leading to the contamination of surrounding properties. These so-called “Vicinity Properties” include Coldwater Creek, which runs near the SLAPS and Latty Avenue Sites and then continues through an area that has grown into densely developed suburbs of St. Louis, before discharging to the Missouri River. Over many years, some of the contamination from SLAPS and Latty Avenue has migrated into Coldwater Creek, as well as onto other neighboring properties. Previous studies and modeling predictions have shown that transport by windblown dust, transport of radon gas in air, surface water runoff, sediment transport and groundwater flow are all proven pathways for contamination to escape into the environment. My supplemental opinions are as follows. Details and the bases for these opinions are provided in Section 2 of this report.

**The record reveals that Cotter committed multiple violations related to hazardous materials management (Supplemental Opinion 1).** Materials-handling practices resulted in the escape of radiological materials and metals from the Latty Avenue site and impacted neighboring properties by a number of migration pathways. Over the years, contamination has spread in the air as windblown dust and radon, via runoff of surface water and surface water sediments, groundwater flow and resuspension from roads. **A consequence of these violations was that effluent limitations were exceeded at the Latty Avenue site (Supplemental Opinion 2).** In addition, **defendants’ possession, use and/or transfer of wastes at SLAPS and Latty Avenue caused excessive radiation to be released in the form of contaminated sediments into Coldwater Creek and tributary ditches (Supplemental Opinion 3).**

## Section 2. Expert Opinions

In 1966, uranium processing wastes from the Mallinckrodt Chemical Works that had been stored at St. Louis Airport Site (SLAPS) were purchased by the Continental Mining and Milling Company and moved to a storage site on Latty Avenue.<sup>1</sup> Wastes included in this transfer included 74,000 tons of Belgian Congo pitchblende raffinate containing approximately 13 tons of uranium; 32,500 tons of Colorado raffinate containing roughly 48 tons of uranium; and 8,700 tons of leached barium sulfate containing about 7 tons of uranium. Some of the material was then dried and shipped to Cotter Corporation's ore processing mill in Canon City, Colorado. The material remaining at the Latty Avenue storage site was sold to Cotter Corporation in 1969 and shipments to Canon City continued through 1970. However, because it could not be economically processed for reclamation, the 8,700 tons of leached barium sulfate (and some other wastes), remained at Latty Avenue. In 1973, this remaining uranium processing waste was mixed with approximately 39,000 tons of soil from Latty Avenue and transported offsite. In 1974, the AEC noted that Cotter's disposition of the leached barium sulfate waste from Latty Avenue was improper: "The disposal does not appear to be within the intent of the Commissions' regulation, 10 CFR Part 40, to allow alteration of the physical nature of Source material (i.e. dilution of solids with nonradioactive source material) in order to obtain a physical mixture which would no longer be subjected to licensing by the Commission."<sup>2</sup>

In 1981, Oak Ridge Associated Universities conducted a radiological characterization of the waste pile and surveyed portions of the northern and eastern vicinity properties for radioactivity.<sup>3</sup> Levels of contamination (principally thorium-230) similar to those on the pile were found in both areas. As a follow-up, ORNL conducted offsite radiological surveys of roadways in the vicinity of Latty Avenue;<sup>4</sup> results indicated contamination in excess of federal guidelines along the road beyond Hazelwood Avenue. Properties adjacent to HISS were also found to be contaminated in excess of guidelines. Soon after, Congress added the Latty Avenue properties to FUSRAP in order to expedite decontamination.

In October 1989, the Environmental Protection Agency (EPA) designated a Superfund site in this area that included the HISS/FUTURA properties, thus subsequent cleanup was to proceed under CERCLA guidelines. In 1992, an Engineering Evaluation/Cost Analysis (EE/CA) for the proposed decontamination

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<sup>1</sup> USACE, 2005, Record of Decision for the North St. Louis County Sites, p. 2-3 to 2-4.

<sup>2</sup> AEC, November 1, 1974, Letter to Cotter Corporation, p. 2

<sup>3</sup> Oak Ridge Associated Universities, 1981, Radiological Evaluation of Decontamination Debris Located at the Futura Chemical Co. Facility in Hazelwood, MO.

<sup>4</sup> ORNL, 1991, Results of Mobile Gamma Scanning Activities in St. Louis, Missouri; ORNL, 1986, Results of the Radiation Measurements Taken at Transportation Routes in Hazelwood, Missouri; ORNL, 1985, Results of the Mobile Gamma Scanning Activities in Berkeley, Bridgeton, and Hazelwood, Missouri.

of HISS and impacted soil from three adjacent Latty properties was published by USACE.<sup>5</sup> The EE/CA called for any contaminated soil excavated from the site to be shipped to an appropriately licensed out-of-state disposal facility.

In March 1998, USACE prepared an EE/CA proposing to remove the waste piles and impacted soil from three adjacent Latty Avenue properties until a comprehensive cleanup could be achieved.<sup>6</sup> USACE started waste and soil removal in spring 2000 and completed this work in 2001. Over 52,000 cubic yards of contaminated material was removed and transported for disposal at an out-of-state disposal facility.

The subsequent 2005 ROD addressed this site as well as SLAPS and the SLAPS Vicinity Properties.<sup>7</sup> The final remedy consisted of excavation to achieve remediation goals for near-surface soils, subsurface soils and stream sediment in and around Coldwater Creek. From 2010-2013, USACE largely focused on characterizing and cleaning up the 148 Vicinity Properties that had been identified as containing or potentially containing contamination that had migrated from SLAPS, Latty Avenue and/or historical haul roads.<sup>8</sup> The 2005 Record of Decision identifies the following compounds as contaminants of concern (COCs)<sup>9</sup>:

Radionuclides	Metals
Radium-226	Antimony
Radium -228	Arsenic
Thorium-228	Barium
Thorium-230	Cadmium
Thorium-232	Chromium
Uranium-234	Molybdenum
Uranium-235	Nickel
Uranium-238	Selenium
Lead-210	Thallium
Protactinium-231	Uranium
Actinium-227	Vanadium

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<sup>5</sup> USACE, 1992, Engineering Evaluation/Cost Analysis-Environmental Assessment for the Proposed Decontamination of Properties in the Vicinity of the Hazelwood Interim Storage Site Hazelwood, Missouri.

<sup>6</sup> USACE, 1998, Engineering Evaluation/Cost Analysis (EE/CA) for the Hazelwood Interim Storage Site (HISS).

<sup>7</sup> USACE, 2005, Record of Decision for the North St. Louis County Sites.

<sup>8</sup> USACE, 2015, Five-Year Review Report Third Five-Year Review Report for Formerly Utilized Sites Remedial Action Program (FUSRAP) St. Louis Sites.

<sup>9</sup> USACE, 2005, Record of Decision for the North St. Louis County Sites, Table 2-2.

**Supplemental Opinion 1. The record reveals that Cotter committed multiple violations related to hazardous materials management**

In preparation for shipping the Latty Avenue radioactive waste to Colorado for reprocessing, there was a waste drying operation at this site from 1968 to 1971. Since completion of my Expert Report, I have learned that in 1970, the Division of Air Pollution Control of the St. Louis County Health Department found the drying operation to be in violation of County Regulations. Specifically, the operation was in violation of the Regulation titled, “Restriction of Emission of Visible Air Contaminants.” In a report describing this situation, Cotter’s contractor, Ryckman, Edgerley, Tomlinson and Associates (RETA)<sup>10</sup> recounted that the Division had received several complaints regarding excessive emissions. Perhaps signaling the urgency of this event, the Division required that the operator submit plans for controlling air pollution emissions from the plant within five days. Presumably, RETA prepared six bimonthly reports each year when they worked at Latty Avenue. To my knowledge, the November 1970 report is the only Bimonthly Report from RETA that has been uncovered during discovery for this case. We do not know if RETA and Cotter continued to have problems with the Division of Air Pollution Control because no additional records appear to remain on this topic. The facility also received a notice of noncompliance from AEC in 1968 on this matter, “The licensee has just begun that portion of his program which may lead to some airborne radiation problems. This part of the program involves drying and loading of the source material residues with the potential condition of airborne contamination.”<sup>11</sup>

The facility also received notices of non-compliance from the Atomic Energy Commission in 1966 and 1967 for contamination in unrestricted areas. The 1966 notice identified five items of non-compliance, including the finding that “contrary to 10 CFR 20.105, on May 16, 1966, radiation levels existed in the unrestricted areas around the “Barrel storage area such that an individual could receive a dose in excess of those limits specified in this part.” It was also found that uranium residues were being stored at this site prior to completion of fencing and installation of locked gates, thus failing to implement a controlled area for these wastes.

In 1967, the AEC inspector reported that “radiation levels were found emitting from the stockpile area in excess of 1.3 mr/hr at 1 meter from the ground and from the barrel storage area at 10 mr/hr at 18 inches from the barrels. Therefore, contrary to 10 CFR 20.105(b)(2), radiation levels exist in the stockpile area and unrestricted area, such that an individual continuously present in this area could receive a dose in

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<sup>10</sup> RETA, November 30, 1970, Bi-Monthly Monitoring Report, Report No. II, October-November 1970 for Cotter Corporation, Latty Avenue Processing Area, Hazelwood, Missouri, COTTER00001461.

<sup>11</sup> AEC, March 27, 1968 Inspection Report, Commercial Discount Corporation (COTTER00002645-2654).

excess of 100 millirem in any seven days.” (AEC, Inspection Sheet for January 11, 1967 Inspection, emphasis added.)

The inspector also found storage material (i.e., radioactive waste) “banked up against the bottom of the cyclone fence, causing it to sag and be partially flattened.” AEC determined that this condition makes for ease of entrance to the controlled areas: “In at least two places around the fence line, it would be simple to hold on to the top of the fence and step over the fence into the licensee’s facility from the outside. AEC also noted that the main gate had a large gap which made for “extreme ease in entering into the licensee’s controlled areas. Finally, AEC noted that windows of the production building were unlocked and opened, providing easy entrance into the building, and therefore into the controlled area. The inspector summed up the situation, concluding that open windows, collapsed fences and open space under that gate negated the “premise that this is a restricted area.” This inspection took place a few months before Cotter Corporation took over the site from Commercial Discount Corp., however, a 1970 inspection report documents that poor housekeeping was a persistent problem at Latty Avenue. As in the previous inspections, the 1970 site visit noted that the perimeter fence was in poor condition and in need of repair.<sup>12</sup> Radiation levels were monitored in various work areas and the inspectors found two locations where 8-hours of exposure would result in an exceedance of AEC limitation of 2.0 mrem/hour. The 1970 inspection also documented uncontrolled release of radioactive material beyond the fence line:

“along the northeastern edge of the property line a quantity of the Congo raffinate material has washed down and under the fence. This material is covering the truck parking lot of the adjacent industry and is definitely a violation of AEC regulations.”<sup>13</sup>

These notices of violation document situations in which Cotter’s possession, use and/or transfer of waste material caused the release of excessive radiation into the environment.

**Supplemental Opinion 2. A consequence of these violations was that effluent limitations were exceeded at the Latty Avenue site.**

In my March 31<sup>st</sup> report, I showed that releases to the atmosphere from the Latty Avenue exceeded the effluent limitations in 10 CFR §20 for thorium-230 and protactinium-241.<sup>14</sup> These exceedances were the result of a waste drying operation that was active at this site from 1968 to 1971, which specifically received at least one notice of violation from the Division of Air Pollution Control of the St. Louis

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<sup>12</sup> Ryckman, Edgerley, Tomlinson and Associates, August 11, 1970, Site Visit Report, Cotter Corporation.

<sup>13</sup> Ryckman, Edgerley, Tomlinson and Associates, August 11, 1970, Site Visit Report, Cotter Corporation, p. 2.

<sup>14</sup> The 10 CFR effluent limitations have been revised by the NRC a number of times over the years; for this case, it is my understanding that the Order envisions comparing site discharges to the original effluent guidelines promulgated in 1960.

County Health Department. The raffinate materials at Latty Avenue had relatively high moisture contents. To reduce shipping costs, operators at Latty Avenue decided to dry the wastes before shipping by rail to Colorado for reprocessing. Drying was accomplished by a rotary dryer that was installed inside a building at HISS. A scraper would collect the wet residue and load it onto a conveyor belt.<sup>15</sup> Material then entered a large inclined rotating cylinder, and as it progressed down the cylinder, air was blown across with waste with a powerful blower. This process reportedly dried the waste from a moisture content of approximately 45-48% to as low as 15%.<sup>16</sup> When the material reached the lower end of the rotating cylinder, it was loaded into open-top railroad cars for transport to Cañon City, Colorado.

In its 1968 inspection report, AEC noted that measurements were made outside the fenced area and that one location “showed 3 mr/hr at 18 inches away from the fence in an unrestricted area, which constituted noncompliance with 10 CFR 20.105(b) in that a person, if continuously present in the area, could receive a dose in excess of 2 millirem in any one hour or a dose in excess of 100 millirems in any seven consecutive days.”<sup>17</sup> This event was clearly an example of possession, use and/or transfer of waste material (in this case, not controlling the erosion and mass wasting of stockpiled materials from waste piles) causing the release of excessive radiation into the environment.

**Supplemental Opinion 3. Defendants’ possession, use and/or transfer of wastes at SLAPS and Latty Avenue caused excessive radiation to be released in the form of contaminated sediments into Coldwater Creek and tributary ditches.**

There are a number of physical fate and transport processes that contributed to the release of contamination from SLAPS and Latty Avenue, impacting Coldwater Creek and other properties. Over the years, contamination has spread via runoff of contaminated surface water and surface water sediments, in the air as windblown dust and radon and via groundwater flow. In addition, contamination was released to the environment via spillage along haul roads to and from SLAPS and Latty Avenue. This roadside contamination was also subject to resuspension and redistribution to locations more distant from the roadways by traffic and wind.

In my March 31, 2019 expert report, I principally addressed contaminant transport by surface water runoff, airborne particulates and radon in air. This was to respond to specific requirements of the

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<sup>15</sup> AEC, March 27, Inspection Report, Commercial Discount Corporation (COTTER00002645-2654).

<sup>16</sup> Goff, W. 1969, Commercial Discount Corporation (CDC) raffinate, letter from W. Goff to D.P. Marcot. May 1. (COTTER00001201-1208). See also AEC, March 27, 1968 Inspection Report for reference to license amendment allowing drying of source material to 15% moisture content.

<sup>17</sup> AEC, March 27, 1968 Inspection Report, Commercial Discount Corporation, p. 6 (COTTER00002652); emphasis in original.

Scheduling Order. As noted in my original report, other transport mechanisms also contributed to offsite exposure of radionuclides and metals from these facilities. It is my opinion that releases of contaminated soil and sediment into Coldwater Creek and its tributary ditches meet the definition of the release of “excessive radiation” as defined in 10 CFR §20. Of particular note, researchers have concluded that an important exposure pathway was transport and redistribution of contaminated sediments down Coldwater Creek and its floodplain (especially during flood events which had the potential to deposit contaminated sediments directly into the yards of residential properties that abut the creek).<sup>18</sup> For example, in the 2003 Feasibility Study, USACE describes sediment contamination as follows:

“Concentrations of Th-230 in sediment ranged from 0.2 to 1400 pCi/g, with the corresponding concentrations of U-238, and Ra-226 ranging from background to 10.9, and background to 25.1, respectively. Sediment with elevated levels of radioactive material is intermittently located in creek bends where natural settling would occur. Contamination levels are highest near SLAPS and HISS, but decrease greatly downstream.”<sup>19</sup>

Mallinckrodt and Cotter would have been aware of this issue because AEC had observed and reported uncontrolled releases of contaminated sediment at least by 1948. In a report by entitled, “Uranium Contamination at Airport Storage Area, St. Louis, Missouri, AEC identified “mud samples” adjacent to what is now known as the SLAPS site with uranium concentrations 190 times that of the normal uranium content in soil.<sup>20</sup> At the time, AEC inspectors attributed the findings of contamination in offsite sediment to “general and frequent rains causing sludge and residue to be washed onto the adjoining property west of the area.”

As cited by Bechtel, Oak Ridge National Laboratory performed radiological surveys at SLAPS in 1976 and 1978. Confirming the 1948 results, these surveys found radioactive materials in the drainage ditches north and south of McDonnell Boulevard and attributed this contamination to runoff from the surface storage of residues. In 1983, Bechtel conducted yet another radiological survey of ditches near SLAPS

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<sup>18</sup> SAIC, 1993b. Evaluation of Contaminated Sediment Transport in Coldwater Creek, St. Louis, Missouri; USACE, 2003, Feasibility Study for the St. Louis North County Site.

<sup>19</sup> USACE, 2003, Feasibility Study for the St. Louis North County Site, p. 2-59.

<sup>20</sup> AEC, November 1, 1948, Uranium Contamination at Airport Storage Area, St. Louis, Missouri, p. 2.

and concluded that approximately 13,000 cubic yards of material should be removed from the ditches. Bechtel also attributed the source of contamination as “rainfall runoff from residues.”<sup>21</sup>

Considering the repeated findings of sediment contamination in ditches and in Coldwater Creek, and considering the repeated conclusion of investigators that the source of this contamination was rainfall runoff from residues stored on these sites, the operators of SLAPS and Latty Avenue were aware or should have been aware that storing radioactive wastes in piles unprotected from wind and rain would cause contaminated residues to wash offsite during rain events.

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<sup>21</sup> Bechtel, August 1983, Radiological Survey of Ditches at the St. Louis Airport Storage Site, p. 8 (prepared for US Department of Energy). Bechtel also noted that another contributor to offsite sediment contamination could have been spills from trucks hauling residues on and off site.